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117. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

A frustum of a paraboloid of revolution closed at both ends has a given volume. Find its interior dimensions when its surface is a minimum.

118. Proposed by J. W. YOUNG, Oliver Graduate Student, Cornell University, Ithaca, N. Y.

Find the differential equations of the system of parabolas,  $y^2 = 4a^2(x + a^2)$ , and of its orthogonal trajectories, and interpret the result. Find also the equation of the system of trajectories.

\*\*\* Solutions of these problems should be sent to J. M. Colaw not later than Jan. 10.

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### MECHANICS.

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105. Proposed by WALTER H. DRANE, Graduate Student, Harvard University, Cambridge, Mass.

A man, weighing 150 pounds at the surface of the earth, ascends in a balloon, until the area visible to him is  $2\pi R^2(1 - \frac{1}{2}\sqrt{2})$ . What is his weight at that height?

106. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy, Irving College, Mechanicsburg, Pa.

Vary the radius of curvature of a plane curve inversely as the abscissa; then the solution will give you, (1) Ryan's Equation of the Elastic Curve, and (2) Wood's Equation of the Hydrostatic Curve.

\*\*\* Solutions of these problems should be sent to B. F. Finkel not later than Jan. 10.

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### AVERAGE AND PROBABILITY.

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97. Proposed by L. C. WALKER, A. M., Professor of Mathematics, Leland Stanford Jr. University, Palo Alto, Cal.

A straight line is drawn at random across a circle, and five points are taken at random in the surface of the circle. Required the chance that all the points are on the same side of the line.

98. Proposed by REV. PREBENDARY WHITWORTH, A. M.

A has £ $m$  and B has £ $n$ . They play for points until one of them has lost all his money. If  $\alpha$  and  $\beta$  be the respective chances that A and B win any point, the expectation of the number of points played will be

$$\frac{n\alpha^n(\alpha^m - \beta^m) - m\beta^m(\alpha^n + \beta^n)}{(\alpha - \beta)(\alpha^{m+n} - \beta^{m+n})}.$$

\*\*\* Solutions of these problems should be sent to B. F. Finkel not later than Jan. 10.

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### MISCELLANEOUS.

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98. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

A particle describes an ellipse under an attraction always directed to the vertex; to determine the law of the attraction.